

DEPARTMENT OF THE ARMY

ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 TUCKER BOULEVARD, NORTH
ST. LOUIS. MISSDURI 63101

12/3 Private Private 17/8 17/8 Privated Stady 7-9-8-2

LMSED-BF

9 July 1982

To Interested Agencies:

The U. S. Army Corps of Engineers has essentially completed its Pine Ford i Study. The study reevaluates the Pine Ford Lake and other authorized projects within the Meramec Basin. It also investigates a variety of other alternatives designed to address the area's water resource problems.

Inclosed for your review is a report which summarizes the investigation and presents its findings and tentative recommendations. The document you are receiving is a draft report and may change slightly as a result of comments received from the public, other agencies, and higher review within the Corps.

Although the inclosed report does not serve as detailed documentation of the study effort, it should be sufficient to meet the review needs of most agencies. If your agency requires greater detail on one or more aspects of this study to complete its review, the St. Louis District will, upon request, do its best to comply by forwarding copies of documentation from its files.

To maintain the schedule established for the processing of this report, all review comments must be received by the St. Louis District not later than 27 August 1982.

If we may be of further assistance, please do not hesitate to write this office or call the study manager, Mr. David Leake, 314-263-5927.

Sincerely,

JACK F. RASMUSSEN, P.E.

Acting Chief, Engineering Division

l Incl As stated (& Copies)

40111316

SUPERFUND RECORDS

2 - 1460

The first the same

PINEFORD

REEVALUATION/PRESIDENTIAL SUMMARY REPORT (DRAFT)

MERAMEC RIVER BASIN, MISSOURI





PINE FORD REEVALUATION/PRESIDENTIAL SUMMARY REPORT

TABLE OF CONTENTS

	SUBJECT	PAGE
PURPOS	1	
DESCRI	. 1	
SCOPE	1	
PRIOR S	2	
STUDYF	PARTICIPANTS AND COORDINATION	2
PUBLIC	3	
DESCRI	4	
PROBLE	5	
MANAGE	6	
SCREEN	ING-OF MEASURES	8
RESULT	8	
LOCAL F	8	
MINE TA	9	
OTHER V	VATER SUPPLY ALTERNATIVES	9
PUBLIC I	10	
CONCLL	SIONS	10
TENTATI	VE RECOMMENDATIONS	11
	LIST OF TABLES	
NO.	TITLE	PAGE
1	CONTRACTOR/AGENCY ASSISTANCE	3
2	METAL CONCENTRATION FACTORS USING IRONDALE AS A CONTROL SITE	7
	LIST OF PLATES	
NO.	TITLE	PAGE
1	1966 MERAMEC BASIN PLAN: AUTHORIZED COMPONENTS	12
2	LEAD AND BARITE TAILINGS SITES	13

PURPOSE AND AUTHORITY

The purpose of this report is to summarize the Pine Ford reformulation study and present its findings. This planning effort has been accomplished under authority of Section 203, Public Law 89-789 which states: "The project for flood protection and other purposes in the Meramec River Basin, Missouri, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 525, Eighty-ninth Congress, at an estimated cost of \$45,971,000: Provided, that construction of this project shall not be initiated until the President has approved a report prepared by the Secretary of the Army reexamining the basis on which the project was formulated and the arrangements for cost sharing."

DESCRIPTION OF AUTHORIZED PROJECT

House Document 525 reprinted portions of the Meramec River, Missouri, Comprehensive Basin Study, dated 30 January 1964 and Summary Report dated June 1965. The basin plan proposed in the authorizing document consisted of five mainstem reservoirs, nineteen angler use sites and several headwater reservoirs proposed for construction by other agencies under existing authorities. Two of the major reservoirs, Meramec Park Lake and Union Lake had been previously authorized by the Flood Control Act of 28 June 1938, and the basin study served to reaffirm these elements. Plan Components authorized for construction by the Corps of Engineers are shown in PLATE 1 and are described in the following paragraphs. Except as noted, all of the lake pools were to be regulated for the purposes of flood control, recreation, water supply, water quality control, and fish and wildlife conservation.

Meramec Park Lake was to be impounded by an earth fill dam (170 feet high) located on the Meramec River approximately 65 miles southwest of St. Louis. The surface area of the normal pool was to be 12,600 acres with the flood control pool covering 23,000 acres.

Union Lake was to have a dam site located on the Bourbeuse River 55 miles west of St. Louis. The earth fill dam would be 151 feet high and would impound water extending over 6,600 acres at normal pool and 12,900 acres at flood control pool.

Pine Ford Lake was to be impounded by an earth fill dam located on the Big River about 45 miles southwest of St. Louis. The dam was to be 141 feet high with a crest length of 2,070 feet. The surface area of the flood control pool was 8,500 acres and normal pool extended over 3,700 acres.

Irondale Lake was to be located in the upper reaches of the Big River with its earth fill dam to be constructed several miles southwest of the town of Irondale, Missouri. Normal pool was to extend over 4,600 acres with the flood control pool increasing to 5,100 acres.

I-38 Lake was to be impounded by an earth fill dam located on the upper reaches of the Bourbeuse River at mile 127.3 above the confluence with the Meramec River. At normal pool, the lake surface would be 850 acres. The flood control pool would extend over 2,950 acres. Unlike the other four reservoirs, I-38 Lake was not authorized for the purpose of water supply.

Angler Use Sites consisted of small parcels of land strategically located along the streams to serve as access and stopping-off points for float fishermen. Some nineteen sites were proposed; each providing sanitary, drinking water and overnight camping facilities.

SCOPE OF STUDY

Since the Pine Ford project was the first element authorized by Public Law 89-789 to receive funding for Advanced Engineering and Design, a basin-wide reevaluation was originally considered in order to prepare a Presidential Report in conjunction with a preconstruction reevaluation report. Two major supporting studies (water supply and recreation) were specifically designed to investigate the problems and needs throughout the basin. Other studies of smaller scope also dealt with basin-wide conditions including coincident flooding analyses in the lower reaches of the Meramec River, mussel studies and water quality testing.

As the study progressed, however, the scope of investigations was narrowed because of the following considerations:

- a. Meramec Park Lake was deauthorized by Public Law 97-128 in January, 1982, and the legislation specified that no additional reservoir plans be considered for the main stem of the Meramec River. For this reason, Meramec Park Lake was not considered in the plan formulation of this study.
- b. The expenditure of study funds to reexamine Union Lake was considered inappropriate for the following reasons. Union Lake no longer received either popular or political support. Both the incumbent Congressman and his predecessor have introduced bills in the House of Representatives to deauthorize the project. A 1976 mail poll conducted by Congressman Ichord among the residents of Franklin County (the lake's location) indicated that over 75 per cent of the 5,200 responding opposed the con-

struction of Union Lake. In addition, the U.S. Fish and Wildlife Service, with the concurrence of the Missouri Department of Conservation, has recommended that the Union Lake not be constructed because of severe adverse impacts on high quality wildlife resources.

c. A reexamination of the I-38 Reservoir was deemed unnecessary for the following reasons. The State of Missouri, by letter dated 17 December 1981, withdrew as local sponsor for recreational development. Low flow augmentation for water quality, in accordance with current EPA policy, has been eliminated as an allowable project purpose. Incorporating these changes and updating previous estimates of costs and benefits to account for the effects of inflation indicate that the project is no longer economically feasible at either the current or authorized interest rate. Much of this same reasoning can also be applied to Irondale Lake, however, it was determined that the uncertainty of future water supply needs made additional study of Irondale Lake advisable. (Water supply was not an authorized purpose at I-38 Lake).

In view of the foregoing considerations, it was decided that, of the originally authorized projects, only Pine Ford Lake, Irondale Lake, and the 19 angler use sites continued to warrant investigation. For reasons discussed later in this paragraph it was also determined that the study-should completely reassess the area's problems and examine a range of alternative solutions, not merely lakes. This decision was made, in large part, because public attitudes and preferences appeared to be changing. In addition, at least one problem which had previously not been recognized was now considered urgent by the general public: heavy metals contamination within the Big River Basin. Also in view of changing state and national policies and priorities, it appeared that some purposes, notably hydropower and flow augmentation for water quality, might be regarded in a different light.

It was therefore determined that, in keeping with the designation of funds as being for the Pine Ford project, this investigation would concentrate on studying Pine Ford Lake, alternative measures of accomplishing the original purposes assigned to Pine Ford Lake, and solutions to additional problems surfaced in the reevaluation. However, in keeping with the need to conduct a reevaluation of the 1966 plan (reduced in scope in accordance with the preceding discussion) it was determined that this study should also address the viability of the authorized angler use sites and Irondale Lake.

PRIOR STUDIES AND REPORTS

Flooding problems within the Meramec River Basin are well documented having been the subject of various Federal studies beginning with a first report of 1881. Other studies of flooding and various water related problems have been prepared by State agencies and private interest groups. For the sake of brevity, only the most current and still pertinent documents are listed below:

- a. Comprehensive Basin Study Meramec River, January 1964, Main Report with appendices A T; prepared by the St. Louis District, Corps of Engineers.
- b. Summary Report, June 1965; prepared by the St. Louis District, Corps of Engineers.
- c. House Document No. 525, eighty-ninth Congress, Second Session.
- d. "Out of Harm's Way," Lower Meramec Valley Flood Damage Reduction Study, November 1981, prepared by the Missouri Department of Natural Resources and the Upper Mississippi River Basin Commission.
- e. "Lower Meramec River Management Study," August 1980; prepared by the St. Louis County Department of Parks and Recreation.
- f. "Lower Meramec Greenway Study Water Quality Considerations," 1980, prepared by the East-West Gateway Coordinating Council.

STUDY PARTICIPANTS/COORDINATION

The Federal agencies with which the study was coordinated include the U.S. Environmental Protection Agency, Region VII, U.S. Department of Interior - Fish and Wildlife Service, the U.S. Bureau of Mines and the National Park Service. Coordinating State agencies included the Missouri Department of Natural Resources (the lead agency) and the Missouri Department of Conservation. In the private sector, coordination was also accomplished with the St. Louis County Water Company and with the Clayton Engineering Company, consultant to Jefferson County, Missouri. Portions of this study accomplished by other agencies and consultants are listed in TABLE 1.

TABLE 1 CONTRACTOR/AGENCY ASSISTANCE*

Study Contribution

Meramec River Basin Water Supply Study

Public Involvement Program

Heavy Metals Investigations

Remedial Measures for Heavy Metals Problems

Supply-Demand Analysis for Outdoor Recreation

Identification of Historical/ Archaeological Features

Surveys of Endangered Species in the Project Area

Mussels

Bats

Big River Instream Flow Needs

Analysis of Coincident Flooding in the Lower Meramec River

Community Profiles of Population Centers in the Project Area

Name of Contractor/Agency

Institute of River Studies University of Missouri-Rolla

Planning and Management Consultants, Ltd. Carbondale, Illinois

U.S. Fish and Wildlife Service Columbia National Fisheries Research Laboratory Columbia, Missouri

Shannon and Wilson, Inc. St. Louis, Missouri

U.S. Department of Interior National Park Service Omaha, Nebraska

Illinois State University Normal, Illinois

University of Missouri Columbia, Missouri

Missouri Department of Conservation Jefferson City, Missouri

Kenwill, Inc. Jackson, Tennessee

U.S. Fish and Wildlife Service Kansas City, Missouri

Institute of River Studies University of Missouri-Rolla

Department of Rural Sociology, University of Missouri Columbia, Missouri

*Includes only those studies supported entirely or partly by project funds.

PUBLIC INVOLVEMENT

In the Corps' planning process, public involvement has played an increasingly important role in recent years. The goals of the Pine Ford public involvement program were formally defined in terms of: identifying the interested individuals and groups, establishing a two-way communications process and providing a structured means for obtaining public input during different stages of the study. The study team has attempted to do this through a number of public workshops, a series of public fact

sheets on the study's progress, a study notebook and a self-guided tour pamphlet of the study area. These public involvement efforts have provided considerable input from interested citizens regarding their perceptions of the problems and their preferences for various types of solutions. See later sections PROBLEMS AND NEEDS and PUBLIC REACTION.

DESCRIPTION OF STUDY AREA

Meramec Basin.

The Meramec Basin lies in the northern flanks of the Ozarks and encompasses some 3980 square miles comprising all or portions of 15 counties. The Meramec River and its two principal tributaries, the Big River and the Bourbeuse River, converge upstream of the St. Louis metropolitan area.. (See PLATE 1). The basin is primarily rural with nearly two-thirds of its watershed forest covered, but the northeastern portion in and around the metropolitan area is becoming increasingly urbanized. Agriculture and mining have historically played an important role in the area's development and continue to do so today. However, for the past several decades both of these industries have declined in importance as a source of employment. Much of this loss of employment has been offset by development of manufacturing industries, particularly in those counties surrounding the St. Louis metropolitan area. Most of the manufacturing outside of the greater St. Louis metropolitan area is confined to light industry.

Lower Meramec River and Big River.

The Big River Basin and the lower Meramec Basin (that portion of the Meramec downstream from the Big River) comprised the area of major concern in this investigation.

The Big River Basin with its timbered hillsides, steep dolomite bluffs, and generally clear, gravel-bottomed streams is quite appealing from an aesthetic standpoint. The river itself is 137 miles long, drains approximately 970 square miles and is one of the few substantially free flowing rivers in the state. The flow has been altered only by the presence of five mill dams within the river's lower 30 miles. The basin is primarily rural with 67 percent of its area forested, 29 percent devoted to crop production and pastures, 2 percent to mining, and the remaining 2 percent devoted to urban areas and other types of development.

Biologically, the Big River Basin comprises a valuable resource. Its undeveloped portions provide an interspersion of habitat types conducive to a wide variety of terrestrial species including important game species such as white-tailed deer and wild turkey. In terms of the fish species present, the Big River may be characterized as a high quality Ozark stream. However, the sediments in the Big River throughout much of the study area contain heavy metals originating from abandoned lead mining operations and from active and inactive barite excavations and processing sites. Elevated levels of these contaminants have been detected throughout the spectrum of aquatic life.

For at least the past 50 years, the basin's economy has depended heavily on agriculture and mining. Crop production has generally been restricted to the alluvial soils in the valleys and flood plain with the thin residual soils on the uplands being suitable for grazing and timber production. Significant mineral deposits consist of lead, barite, limestone, sand and gravel.

U.S. Census data indicates a somewhat declining role for both agriculture and mining. Data for the three principal basin counties (Jefferson, Washington and St. François) indicates that between 1930 and 1974 the number of farms declined by 64 percent and the number of acres devoted to farming declined by 44 percent. Census data also indicates that from 1940 to 1970 the number of people employed in agricultural services declined by 80 percent within the three counties. It appears however, that agriculture's downward trends may level off in the near future. The trend in mining employment tends to be mixed and exhibits a somewhat cyclical behavior. For the three counties as a whole, however, mining employment dropped 41 percent during the interval from 1930 to 1970. The drop in Washington and St. Francois Counties was more dramatic (51 percent) largely due to the exhaustion of the Old Lead Belt in St. François County, once the world's major producing area. The drop would have been even more precipitous were it not for the increase in barite mining in Washington County within the past few decades. By contrast, mining employment within Jefferson County has increased by 443 people (354 percent).

The remainder of the study area is comprised of the Meramec River Basin downstream of the Big River's mouth, an area of roughly 330 square miles. The watershed, which is about evenly split between St. Louis and Jefferson Counties, is largely urban and will become increasingly so in the future. The lower Meramec River flood plain is roughly 22 percent forested, 21 percent developed, 55 percent open land (over half of which is cropland), and 2 percent water-covered (a considerable portion of which consists of sand and gravel pits). Several municipalities have significant portions of their commercial and residential properties within the flood plain. State and local governments also have sizable holdings within the flood plain, usually in the form of parks or wildlife conservation areas. According to St. Louis County's General Plan (1981) additional tracts of flood plain are projected for acquisition for recreation by the year 2000.

PROBLEMS AND NEEDS

The water-related problems and needs were identified primarily from three sources: historical records maintained by the Corps and other agencies, technical studies conducted by the Corps and other agencies, and input received from the general public at the October 1981 public workshops. The following paragraphs summarize the major problems identified in the course of this investigation.

Heavy Metals Contamination.

The degradation of the Big River caused by mining wastes was frequently mentioned by attendees of the October workshop and was the problem ranked as most serious. The problem affects more than the river's water quality. Although water quality is a problem, it is not a major concern from the standpoint of human consumption since standard treatment techniques will easily remove the quantities of lead, manganese and iron which are in excess of Missouri Drinking Water Standards. A more serious aspect of the problem is the fact that toxic metals have become concentrated in the streambed sediment and are being taken up by plant and animal life in and along the Big River. Studies conducted by the U.S. Fish and Wildlife Service indicate that every biological aspect sampled at sites downstream of mined areas showed elevated concentrations of metals when compared to samples from a control site near Irondale which was upstream of mined areas. Results are shown in TABLE 2. These same studies indicated that the metals are being transported downstream. These studies did not trace the metals back to their source, hence the degree to which mining wastes contribute to the problem as opposed to the degree to which natural sources contribute was not determined. Investigations conducted by the Missouri Department of Conservation in 1980 resulted in a warning being issued to Big River fishermen to not eat the black redhorse, a member of the sucker family, because lead concentrations in edible portions of the fish exceeded recommended levels for human consumption.

Flooding.

Major floods have occurred on the lower Meramec River on the average of once every six years. During the 20th Century, major floods were experienced in 1904, 1915 (maximum flood on record), 1916, 1927, 1933, 1935, 1939, 1942, 1945, 1947, 1950, 1957, 1961, 1969, 1973 and 1979. Floods on the lower Meramec can be caused independently by heavy, long duration rainfall over the drainage basin or by backwater from Mississippi River flooding or by both mechanisms concurrently. Big River floods can

occur in the same fashion although the backwater it experiences from the Meramec is normally of much shorter duration. Flood damages on the lower 43 miles of the Big River and the lower 38 miles of the Meramec River average \$10,840,000 annually and are distributed as follows:

Big River Structural Damage: \$ 485,000
Big River Agricultural Damage: \$ 1,351,000
Lower Meramec Structural Damage: \$ 8,672,000
Lower Meramec Agricultural Damage: \$ 332,000

Total: \$10,840,000

Water Supply.

The adequacy of future water supplies is an issue of considerable concern to the area's residents. At the October 1981 workshops, the public mentioned water supply more frequently than any other problem and also ranked it as one of the most important. Assessing the magnitude of future water supply needs presented considerable difficulty in that it required assumptions concerning future population growth and future consumption rates. Although the Corps contracted for an independent water supply study of the entire Meramec Basin, there remains considerable disagreement between the State of Missouri and the Corps as to the appropriate basic assumptions and, hence, the validity of the study's findings. The disagreements surrounding this study have most likely contributed to the authorization of a new Meramec Basin water supply study (Section 2 of Public Law 97-128). However, to fully assess the feasibility of the Pine Ford Lake, it was necessary to use the results of the disputed study to determine the amount of storage needed for future water supply.

The findings of this study indicate that the great majority of the Meramec Basin and surrounding area will continue to find its current water supply sources (primarily groundwater) adequate for the forseeable future. However, as population and water usage increases, the area in southern St. Louis County and northern Jefferson County which currently draws from the Meramec River may find the river to be an inadequate source during times of drought early in the next century. Even at current rates of withdrawal, it appears that a severe drought could cause adverse impacts to aquatic life on the lowest reaches of the Meramec River.

Recreation.

Next to water supply, attendees at the problem identification workshops mentioned recreation more frequently than any other water resource need but ranked it somewhat lower than the preceding problems. Within the study area, the Missouri Statewide Comprehensive Outdoor Recreation Plan (SCORP) for 1980-1985 indicated priority needs

(determined through a public participation program) for river access areas, lake recreation, trails, hunting lands and preservation of unique natural areas. Furthermore, a 1979 study conducted for the Corps by the National Park Service concluded that a strong unmet demand existed for the types of recreation activities associated with lakes. This conclusion was based on national average standards and weekend peaking of use. However, the State of Missouri disagreed with this finding since the use of Missouri SCORP standards did not support the conclusion that additional water surface acres were needed.

Environmental Quality.

Concerns relating to environmental quality and fish and wildlife conservation were also mentioned frequently at the problem identification workshops. In addition to contaminating aquatic life as earlier discussed, mine tailings cover the river's streambed, thus reducing the fairly diverse aquatic habitat of the natural gravel bottom to a much less productive streambed of shifting sand. Terrestrial habitat, particularly within the lower Meramec Basin, is being displaced by urban development. Two bat species (the gray and the Indiana) classified as endangered by Federal criteria use the Big River. It is likely that the bald eagle, also endangered, visits the area in winter. One endangered mussel (Lampsilis orbiculata) has been noted in the lower Meramec River, Finally, archaelogical and cultural resources are deteriorating through neglect and vandalism.

Other Problems and Opportunities.

Other problems which workshop participants mentioned less frequently included soil erosion, preserving the quality of life within the area, poor land use, and the need for hydropower.

MANAGEMENT MEASURES CONSIDERED

Initially a wide variety of technical and institutional means were identified which could address the problems identified. The implementation of many of these measures depends on entities other than the Corps of Engineers. These measures are listed below, categorized as to whether they are primarily structural or nonstructural measures.

Non-structural.

- Floodproofing floodprone buildings.
- Relocating flood plain residents to sites out of the flood plain.
- Providing a flood warning system with temporary evacuation.
- Enacting flood plain regulations (zoning/building codes).
- Developing greenbelt corridors along streams.
- Providing public access areas to the rivers.
- Implementing water conservation practices.
- Providing interconnections between water utilities.
- Planting vegetation on lead tailings ponds to reduce erosion.
- Covering erodible tailings with fabric.
- Removing and reprocessing lead and barite tailings.

Structural.

- Constructing levees or floodwalls.
- Enlarging and straightening the rivers.
- Constructing dry reservoirs to retain flood waters.
- Constructing multipurpose (wet) reservoirs.
- Constructing water supply reservoirs.
- Constructing water supply pipelines.
- Drilling wells for water supply in the Meramec River Alluvium.
- Improving tiff (barite) pond dams to reduce the chance of failure.
- Providing detention basins downstream of mine tailings.
- Diverting runoff and streamflow around tailings.
- Constructing detention basins within the river to trap mine tailings.

TABLE 2

Metal Concentration Factors Using Irondale As A Control Site *

Aspect Sampled	Irondale (River Mile 118)	Desloge	Washington State Park	Brown's Ford (River Mile 49)
Streambed Sediment				
Lead	1 X	45X	37X	29X
Cadmium	1 X	18X	7X	4X
Zinc	1 X	26X	11X	7X
Copper	1 X	5X	4X	4X
Barium	1 X	<1X	3X	3X
Crayfish				
Lead	1 X	100X	93X	78X
Cadmium	1 X	4X	3X	3X
Zinc	1X	2X	2X	1 X
Copper	1 X	1 X	1 X	1 X
Barium	1 X	<1X	1 X	1 X
Pocket Mussels (Soft Tissu	e) 🗸			
Lead	1X	**	113X	179X
Cadmium	1 X	**	41X	70X
Zinc	1 X	**	8X	27X
Copper	1X	**	8X	9X
Barium	1X	• •	<1X	<1 X
Redhorse (Suckers)				
Lead	1 X	28X	22X	34X
Cadmium	1 X	3X	1 X	1 X
Zinc	1 X	2X	1 X	1 X
Copper	1X	<1X	<1X	<1X
Barium	1 X	<1X	1 X	2X
Attached Algae				
Lead	1 X	74X	38X	40X
Cadmium	1 X	3X	4X	4X
Zinc	1 X	16X	7X	8X
Copper	1 X	2X	1 X	1 X
Barium	1 X	<1X	<1 X	1 X
Water Willow (Roots)				
Lead	1 X	127X	42X	63X
Cadmium	1X	70X	20X	9X
Zinc	1 X	23X	15X	11X
Copper	1 X	2X	4X	3X
Barium	1 X	1 X	6X	4X

^{*} Concentrations used to develop this table were taken from studies conducted by Schmitt and Finger, U.S. Fish and Wildlife Service, February 1982.

^{**} No Mussels were found at Desloge.

<1X means less than Irondale Concentration, 3X means 3 times greater than Irondale Concentration.

SCREENING OF MEASURES

A preliminary examination of the preceding measures resulted in a number of them being dismissed from further consideration. First of all, an inventory of access areas being provided by the State of Missouri within the Meramec Basin indicated that the need for such facilities is being met. For this reason, consideration of additional river access areas, including the 19 angler use sites currently authorized, was dismissed. Enlarging and straightening the Big River and lower Meramec River was also dismissed because of the environmental and aesthetic degradation it would cause. Reprocessing mine tailings was dismissed after discussions with the U.S. Bureau of Mines which concluded that the measure was economically infeasible and presented problems with respect to a safe disposal site for the reprocessed tailings. Wells in the Meramec River alluvium were also dismissed as being inadequate to supply the quantities of water needed for the southern St. Louis Metropolitan Area. Finally, a water supply pipeline from the Mississippi River was dismissed after discussions with the major utility in the area because of the severe treatment problems posed by the variable water quality in the Mississippi River below the city of St. Louis.

RESULTS OF LAKE STUDIES

As discussed earlier (see SCOPE OF STUDY). the reservoir analysis was limited to two lakes, Pine Ford and Irondale. Since Pine Ford Lake was being funded by Congress for advanced engineering and design, it was investigated in considerably more detail than was Irondale Lake. It should also be pointed out that, for an authorized project, it is normally Corps policy to include consideration of recreation as a purpose only if it has a current letter of intent from a prospective non-Federal sponsor. Although the State of Missouri in 1966 furnished a letter of intent to sponsor recreation at Pine Ford. Irondale, and I-38 Lakes, it withdrew that intent in 1979 citing fiscal and constitutional problems with such commitments. At the request of the St. Louis District Corps of Engineers, the State is currently reviewing that decision. For this reason and because, for an initial screening of economic feasibility, the St. Louis District wished to test these two reservoir sites as if developed to their fullest extent (thus yielding the best possible economic results), recreation development was included in the reservoir analyses.

The Pine Ford Lake was formulated to include provisions for flood control, water supply, low flow augmentation for downstream aquatic life, recreation, and hydropower. Incidental benefit to navigation on the Mississippi River also resulted

from reservoir releases for other purposes. Thirteen separate dam sites were examined between Morse Mill and Brown's Ford Bridge (a 16 mile reach) before the best Pine Ford site was selected. At the selected site a number of different size reservoirs were tested. Flood protection storages ranging from 📝 a 5-year flood to storage of a 200-year flood were examined. Several sizes of normal pool were also tested. Pine Ford Lake was examined and benefits were assigned as though that lake would be the only lake (of the original five authorized) to be constructed within the basin. In addition, Pine Ford Lake was formulated assuming that both Pine Ford Lake and Ifondale Lake would be constructed. In all cases tested. Pine Ford Lake failed the basic economic test of returning at least as much in average annual benefits as it cost when amortized over a 100-year project life at 3-1/4 percent interest. At its optimum size, the lake was estimated to cost approximately \$170 million and to return approximately \$0.90 for every dollar invested. All cases developed for a dry detention (flood control only) reservoir were economically infeasible by an even greater margin. In addition, the fact that the lake's drainage area contains large deposits of lead and barite mine tailings also creates a major uncertainty with respect to the viability of a lake at this site. The mine wastes, a current problem for the Big River even without a reservoir (see WATER RELATED PROBLEMS), could undergo chemical reactions within a deep lake which would release even more potentially toxic metals to the environment. Finally, the U.S. Fish and Wildlife's assessment of the lake's adverse impacts on fish and wildlife habitat has caused that agency to oppose construction of the lake.

Irondale was formulated using much the same assumptions that were used for the Pine Ford formulation. The level of detail in developing costs, however, was considerably less than that employed for Pine Ford. Also, alternative dam sites were not examined for Irondale (only the authorized site), and the feasibility of including hydropower was not examined. The results, which for Irondale should be regarded as preliminary, indicate that a reservoir at Irondale is also economically infeasible.

LOCAL FLOOD DAMAGE PREVENTION MEASURES

Local measures are so classified because, unlike lakes, they primarily affect only the immediate area in which they are implemented. With regard to these measures, the Pine Ford study confined its investigation to the area where the majority of flood damages were concentrated, namely the lower Meramec River. (Previous sections indicated that roughly 85 percent of the area's total damages and nearly 95

percent of structural damages occur in this reach.) It is also important to note that the examination of these measures has been preliminary. The recent authorization of a future study of flood damage prevention measures on the lower Meramec River (Public Law 97-128) should permit a more detailed investigation of these measures. Nevertheless, a discussion of preliminary findings is presented in the following paragraphs.

Levees. Levees were examined for nine communities along the lower Meramec River. In each case only one size of levee was examined - a height sufficient to protect against the highest flood which could reasonably be expected (termed a "standard project flood"). The results, assuming a 100-year project life and a current interest rate of 7-5/8 percent, indicated that few, if any, levees appeared to be economically justified for this particular level of protection. There is the possibility that a more detailed study examining a lesser degree of protection and somewhat different levee alinements could produce an economically feasible plan. It is recommended that such studies be pursued by the Corps under the authority granted in Section 2 of Public Law 97-128.

Non-structural Measures. A number of nonstructural flood damage prevention measures for the lower Meramec River were also examined in a preliminary fashion. Floodproofing homes and businesses and relocating homes and businesses to sites outside the flood plain both yielded results which were encouraging enough to warrant more detailed study. A greenbelt corridor plan which connected several existing riverside parks and other publicly owned lands along the lower 34 miles of the Meramec River was also investigated. Preliminary results indicate that this measure should also be investigated in greater detail. Two other measures, flood plain regulations and a flood warning system coupled with emergency evacuation procedures are also deserving of further investigation. At the February public workshops, the attendees expressed a greater preference for flood plain regulations than for any other structural or nonstructural measure presented. However, only 12 percent of the attendees were residents of communities which would be candidates for such regulations.

Successful implementation of almost any nonstructural plan requires acceptance by those people directly affected. To gain acceptance, or to determine the lack of it, requires an intensive public involvement program in the specific locale where nonstructural plans are being proposed. It requires a gradual progression from general concepts to ever more detailed plans with considerable sharing of these results with the affected public along the way. The large geographic scope and wide range of plans covered by this study have not permitted this type of intensive effort on nonstructural plans. It is recommended that such studies be pursued by the Corps under the authority granted in Section 2 of Public Law 97-128.

MINE TAILING REMEDIAL MEASURES

As pointed out earlier, it has not been conclusively proven that mine tailings are the only significant source of toxic metal contaminants in the Big River. However, it is generally accepted that the tailings are a major source of such contaminants. The public, as demonstrated at the October 1981 Problem Identification Workshops, regarded the problem of toxic metal contamination as the area's most pressing problem.

The Corps of Engineers has examined a number of measures (see MANAGEMENT MEASURES CONSIDERED) which could address this major source of contaminants. Additional study will be necessary to better define the problem and refine the design of remedial measures. Also, because of the precedent setting nature of Federal involvement in such actions, implementation responsibilities and cost sharing remain to be resolved. In selecting remedial measures, the preferred solution was containment of the tailings at the site rather than attempting to reclaim the tailings once they had entered the surface waters. The most promising measures consist of various combinations (depending on the site being addressed) of the following:

- Regrading embankment slopes.
- Covering embankment with fabric and/or riprap.
- Vegetating the surfaces of tailings ponds.
- Enlarging and/or riprapping emergency spillways.
- Constructing sedimentation ponds downstream of tailings sites.

OTHER WATER SUPPLY ALTERNATIVES

Multipurpose reservoirs, the one water supply alternative in which the Federal Government can cost share, has already been discussed. Other means of supplying water to serve the future needs of the southern St. Louis metropolitan area were investigated for two reasons. First, it is obvious that in a water rich area such as the St. Louis metropolitan area, there are numerous solutions to the problem. The task is one of selecting the cheapest, most reliable, and least environmentally damaging solution. Secondly, the benefits attributable to water supply storage in a reservoir are most commonly assumed to be the cost of the most likely alternative source.

Hence, to determine multipurpose reservoir benefits it is necessary to investigate other options.

Three structural options were investigated: a single purpose water supply reservoir at the Irondale site on the Big River, a pipeline to transfer treated water from the Missouri River directly to the area of need, and a pipeline to divert Missouri River water to the Bourbeuse River where it would then flow into the Meramec River and be carried downstream to the area of need. St. Louis County Water Company has indicated that piping treated water from the Missouri River would be the option most likely to be pursued by them at such future time as the Meramec River proved to be an unreliable source. Based on preliminary studies, the cheapest of the three alternatives, however, appears to be the diversion of Missouri River water to supplement natural flows on the Bourbeuse and Meramec Rivers during times of drought. Although settling basins were included in the plan to reduce the higher silt load of Missouri River water, additional means of addressing chemical differences between the two river systems may be required to prevent environmental damage on the Bourbeuse and Meramec Rivers. It may also be necessary to address certain legal ramifications involved in an interbasin transfer of water. The third structural option, development of a single purpose water supply reservoir at Irondale, appears to be more expensive than either of the pipeline alternatives. Additional development of the Irondale site to include recreation or other purposes could render a much more economically attractive option.

An investigation of certain water conservation measures indicated that implementation of some measures are probably cost effective and would also delay into the future the time when alternative water supply sources are needed.

The results of this water supply investigation indicates that additional study is needed, first of all, to better define the extent of future needs and secondly to investigate a wider range of alternatives in greater detail than has been addressed in this study. Section 2 of Public Law 97-128 which authorized the Corps to conduct a Meramec Basin water supply study in full cooperation with the State of Missouri should satisfy this need.

PUBLIC REACTION

Public workshops were held in February 1982 to present some 20 different measures, including "No Corps Action", which addressed the problems within the study area. Attendees were also asked to rate each measure on a numerical scale to indicate whether the measure was preferred or not preferred.

When the results were tallied, few measures stood out dramatically. One measure, "Flood Plain Regulations" was rated significantly higher than the others and elicited less disagreement than most. "River Access Areas" was also rated relatively high and met with considerable agreement among attendees. The least preferred measures included "Sediment Traps", "Rerouting Big River" (to address heavy metals contamination), "Missouri River/Bourbeuse River Pipeline", "Single Purpose Irondale Reservoir" (water supply), "Floodproofing", and "Single Purpose (flood control) Reservoirs".

The greatest disagreement occurred on the subject of "Multipurpose Reservoirs" and "No Corps Action". Ratings on these proposals tended to be strongly "for" or strongly "against" with very few in the more neutral ranges of the scale. Considering the heavy snow cover and frigid temperatures at the time of the workshops, it is perhaps understandable that those who attended were highly motivated. Since the polarized views tended to average out overall, these two proposals tended to rank toward the middle of all measures with "No Corps Action" being somewhat more preferred than "Multipurpose Reservoirs".

Considerable disagreement was also evident for the nonstructural measures "Water Conservation", "Greenbelts", and "Permanent Flood Plain Evacuation", although not as great as for the preceding two measures.

CONCLUSIONS

After a reexamination of the problems and needs within the study area and a reevaluation of measures which could address those problems and needs, the study team has concluded the following:

a. A Pine Ford Reservoir for the purposes of flood control, water supply, recreation, fish and wildlife conservation and other incidental benefits is infeasible due to lack of economic justification (at both the current interest rate of 7-5/8 percent and the authorized rate of 3-1/4 percent) and also due to the potential of a reservoir at that location to increase the concentrations of heavy metals in various biological elements. This finding holds true regardless of the combination of purposes or the physical scale of the facility. The uncertainties associated with further heavy metals contamination within a reservoir would remain a concern even with the considerable positive effects of accomplishing remedial measures for existing and future mining wastes. Moreover, results of the public involvement program indicate that a Pine Ford Lake would experience a mixed reception from the public. Other, less comprehensive measures or no action at all appear to enjoy somewhat wider acceptance. In addition, the State of Missouri has withdrawn its letter of intent to sponsor recreation at the project. Efforts to secure a recreation sponsor with the State and the appropriate counties have been unsuccessful to date. Finally, the U.S. Fish and Wildlife Service, in its Coordination Act Report, indicates that it opposes construction of Pine Ford Lake due to the associated loss of fish and wildlife habitat.

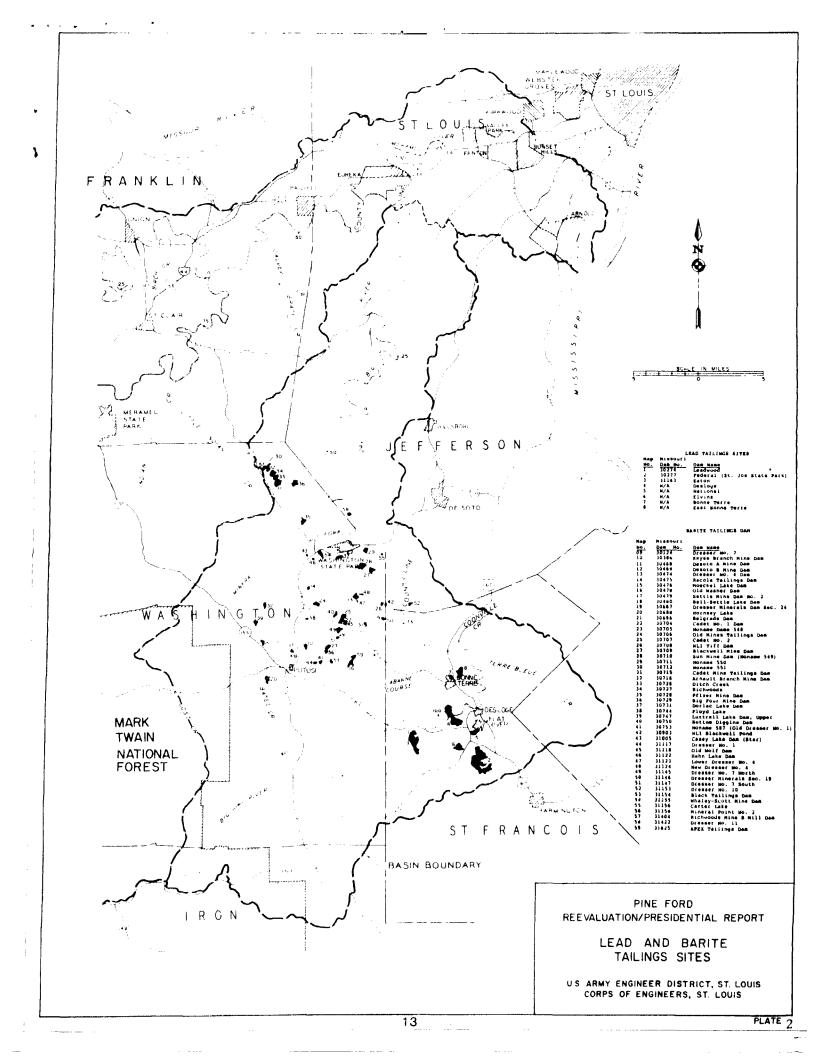
- b. Any decision concerning the Irondale Reservoir should be postponed until the results of the recently initiated Meramec Basin Water Supply Study (authorized by Section 2 of Public Law 97-128) are available to better define this need. Although the Irondale Reservoir, at its authorized size, appears economically infeasible at this time, based on preliminary studies, a definite finding regarding this reservoir can be made only upon completion of detailed engineering and economic studies. If the Meramec Basin Water Supply Study indicates that the Irondale Lake is the best solution to the area's problems, a separate reevaluation study would be conducted using project-specific funding.
- c. The need for the nineteen angler use sites, authorized as part of the comprehensive basin plan, no longer exists. This need has been met or is in the process of being met by facilities provided by the State of Missouri.
- d. No extensive reexamination of the I-38 Reservoir was necessary for the following reasons. The State of Missouri, by letter dated 17 December 1981, withdrew as local sponsor for recreational development. Low flow augmentation for water quality, in accordance with current EPA policy, has been eliminated as an allowable project purpose. Incorporating these changes and updating previous estimates of costs and benefits to account for the effects of inflation indicate that the project is no longer feasible at either the current interest rate or the authorized rate. Therefore, expenditure of study funds to examine this measure in greater detail was viewed as both unnecessary and imprudent.
- e. Any extensive reexamination of Union Lake would be an unwise use of study funds. As the basis for this conclusion, the project is not currently supported by any member of the Congressional delegation, and both the incumbent Congressman and his predecessor have introduced bills to deauthorize the project. Underlying this Congressional action is the fact that the project is not generally supported by the local population (as evidenced by surveys conducted by Congressional interests). In addition, the U.S. Fish and Wildlife Service, with the concurrence of the Missouri Department of Conservation, has recommended that the project not be constructed because of severe adverse impacts on high quality wildlife resources.

f. The area has several significant problems which should receive additional study either under existing or proposed authorities. Flooding along the lower Meramec River is a major problem which should be further addressed under authority granted by Section 2 of Public Law 97-128. Structural and nonstructural measures which appear worthy of further study include levees, floodproofing, permanent relocation in conjunction with a greenbelt corridor, a flood warning system and flood plain regulations. Since considerable disagreement exists concerning the results of the current water supply study, further study into the area's future water supply needs and alternative solutions is advised. Section 2 of Public Law 97-128 grants this authority. Finally, under existing conditions, heavy metals contamination within the Big River system poses serious harm to plant and animal life within and along the stream and hence indirectly to man. Studies to date indicate that this problem could substantially be reduced by the implementation of remedial measures at or near the sites of mining wastes. However, additional studies are needed to better define the problem and further develop remedial measures. At present, there is no existing authority for further study of this problem.

TENTATIVE RECOMMENDATIONS

In view of the foregoing, it is recommended that:

- a. The Pine Ford Reservoir and the nineteen angler use sites, as authorized by Section 203 of Public Law 89-789, be deauthorized.
- b. The I-38 Reservoir, as authorized by the above cited legislation, be placed in an inactive status to become eligible for the project deauthorization review program.
- c. The Union Reservoir, authorized by Section 4 of Public Law 75-761 be placed in an inactive status to become eligible for the project deauthorization review program.
- d. The Irondale Reservoir, as authorized by Section 203 of Public Law 89-789, retain its active status until completion of the Meramec Basin Water Supply Study better defines the needs that the project might serve.
- e. The Meramec Basin Water Supply Study and the Lower Meramec River Flood Control Study, both authorized by Section 2 of Public Law 97-128, be undertaken to better define those problems and their potential solutions.
- f. The Corps of Engineers be authorized to conduct additional studies of the problem of stream contamination from mine tailings in streams of the Meramec Basin to determine the economic and environmental feasibility of various remedial measures.



CLARY

PINE FORD

REEVALUATION/PRESIDENTIAL SUMMARY REPORT (DRAFT)

MERAMEC RIVER BASIN, MISSOURI



PINE FORD REEVALUATION/PRESIDENTIAL SUMMARY REPORT

TABLE OF CONTENTS

	SUBJECT	PAGE		
PURPOS	E AND AUTHORITY	1		
DESCRIPTION OF AUTHORIZED PROJECT				
SCOPE	OF STUDY	1		
PRIOR STUDIES AND REPORTS				
STUDYP	ARTICIPANTS AND COORDINATION	2		
PUBLIC I	NVOLVEMENT	3		
DESCRIP	PTION OF STUDY AREA	4		
PROBLE	MS AND NEEDS	5		
MANAGE	MENT MEASURES CONSIDERED	6		
SCREEN	ING OF MEASURES			
RESULTS OF LAKE STUDIES				
LOCAL FLOOD DAMAGE PREVENTION MEASURES				
MINE TAI	LINGS REMEDIAL MEASURES	9		
OTHER V	VATER SUPPLY ALTERNATIVES	9		
PUBLIC F	REACTION	10		
CONCLU	SIONS	10		
TENTATI	VE RECOMMENDATIONS	11		
	LIST OF TABLES			
NO.	TITLE	PAGE		
1	CONTRACTOR/AGENCY ASSISTANCE	3		
2	METAL CONCENTRATION FACTORS USING IRONDALE AS A CONTROL SITE	7		
	LIST OF PLATES			
<u>NO.</u>	TITLE	PAGE		
1 2	1966 MERAMEC BASIN PLAN: AUTHORIZED COMPONENTS LEAD AND BARITE TAILINGS SITES	12 13		
4	FEVN VIAN DAVITE I VIFIII 09 91169	10		

PURPOSE AND AUTHORITY

The purpose of this report is to summarize the Pine Ford reformulation study and present its findings. This planning effort has been accomplished under authority of Section 203, Public Law 89-789 which states: "The project for flood protection and other purposes in the Meramec River Basin, Missouri, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 525. Eighty-ninth Congress, at an estimated cost of \$45,971,000: Provided, that construction of this project shall not be initiated until the President has approved a report prepared by the Secretary of the Army reexamining the basis on which the project was formulated and the arrangements for cost sharing."

DESCRIPTION OF AUTHORIZED PROJECT

House Document 525 reprinted portions of the Meramec River, Missouri, Comprehensive Basin Study, dated 30 January 1964 and Summary Report dated June 1965. The basin plan proposed in the authorizing document consisted of five mainstem reservoirs, nineteen angler use sites and several headwater reservoirs proposed for construction by other agencies under existing authorities. Two of the major reservoirs, Meramec Park Lake and Union Lake had been previously authorized by the Flood Control Act of 28 June 1938, and the basin study served to reaffirm these elements. Plan Components authorized for construction by the Corps of Engineers are shown in PLATE 1 and are described in the following paragraphs. Except as noted, all of the lake pools were to be regulated for the purposes of flood control, recreation, water supply, water quality control, and fish and wildlife conservation.

Meramec Park Lake was to be impounded by an earth fill dam (170 feet high) located on the Meramec River approximately 65 miles southwest of St. Louis. The surface area of the normal pool was to be 12,600 acres with the flood control pool covering 23,000 acres.

Union Lake was to have a dam site located on the Bourbeuse River 55 miles west of St. Louis. The earth fill dam would be 151 feet high and would impound water extending over 6,600 acres at normal pool and 12,900 acres at flood control pool.

Pine Ford Lake was to be impounded by an earth fill dam located on the Big River about 45 miles southwest of St. Louis. The dam was to be 141 feet high with a crest length of 2,070 feet. The surface area of the flood control pool was 8,500 acres and normal pool extended over 3,700 acres.

Irondale Lake was to be located in the upper reaches of the Big River with its earth fill dam to be constructed several miles southwest of the town of Irondale, Missouri. Normal pool was to extend over 4,600 acres with the flood control pool increasing to 5.100 acres.

I-38 Lake was to be impounded by an earth fill dam located on the upper reaches of the Bourbeuse River at mile 127.3 above the confluence with the Meramec River. At normal pool, the lake surface would be 850 acres. The flood control pool would extend over 2,950 acres. Unlike the other four reservoirs, I-38 Lake was not authorized for the purpose of water supply.

Angler Use Sites consisted of small parcels of land strategically located along the streams to serve as access and stopping-off points for float fishermen. Some nineteen sites were proposed; each providing sanitary, drinking water and overnight camping facilities.

SCOPE OF STUDY

Since the Pine Ford project was the first element authorized by Public Law 89-789 to receive funding for Advanced Engineering and Design, a basin-wide reevaluation was originally considered in order to prepare a Presidential Report in conjunction with a preconstruction reevaluation report. Two major supporting studies (water supply and recreation) were specifically designed to investigate the problems and needs throughout the basin. Other studies of smaller scope also dealt with basin-wide conditions including coincident flooding analyses in the lower reaches of the Meramec River, mussel studies and water quality testing.

As the study progressed, however, the scope of investigations was narrowed because of the following considerations:

- a. Meramec Park Lake was deauthorized by Public Law 97-128 in January, 1982, and the legislation specified that no additional reservoir plans be considered for the main stem of the Meramec River. For this reason, Meramec Park Lake was not considered in the plan formulation of this study.
- b. The expenditure of study funds to reexamine Union Lake was considered inappropriate for the following reasons. Union Lake no longer received either popular or political support. Both the incumbent Congressman and his predecessor have introduced bills in the House of Representatives to deauthorize the project. A 1976 mail poll conducted by Congressman Ichord among the residents of Franklin County (the lake's location) indicated that over 75 per cent of the 5,200 responding opposed the con-

struction of Union Lake. In addition, the U.S. Fish and Wildlife Service, with the concurrence of the Missouri Department of Conservation, has recommended that the Union Lake not be constructed because of severe adverse impacts on high quality wildlife resources.

c. A reexamination of the I-38 Reservoir was deemed unnecessary for the following reasons. The State of Missouri, by letter dated 17 December 1981, withdrew as local sponsor for recreational development. Low flow augmentation for water quality, in accordance with current EPA policy, has been eliminated as an allowable project purpose. Incorporating these changes and updating previous estimates of costs and benefits to account for the effects of inflation indicate that the project is no longer economically feasible at either the current or authorized interest rate. Much of this same reasoning can also be applied to Irondale Lake, however, it was determined that the uncertainty of future water supply needs made additional study of Irondale Lake advisable. (Water supply was not an authorized purpose at I-38 Lake).

In view of the foregoing considerations, it was decided that, of the originally authorized projects, only Pine Ford Lake, Irondale Lake, and the 19 angler use sites continued to warrant investigation. For reasons discussed later in this paragraph it was also determined that the study should completely reassess the area's problems and examine a range of alternative solutions, not merely lakes. This decision was made, in large part, because public attitudes and preferences appeared to be changing. In addition, at least one problem which had previously not been recognized was now considered urgent by the general public: heavy metals contamination within the Big River Basin. Also in view of changing state and national policies and priorities, it appeared that some purposes, notably hydropower and flow augmentation for water quality, might be regarded in a different light.

It was therefore determined that, in keeping with the designation of funds as being for the Pine Ford project, this investigation would concentrate on studying Pine Ford Lake, alternative measures of accomplishing the original purposes assigned to Pine Ford Lake, and solutions to additional problems surfaced in the reevaluation. However, in keeping with the need to conduct a reevaluation of the 1966 plan (reduced in scope in accordance with the preceding discussion) it was determined that this study should also address the viability of the authorized angler use sites and Irondale Lake.

PRIOR STUDIES AND REPORTS

Flooding problems within the Meramec River Basin are well documented having been the subject of various Federal studies beginning with a first report of 1881. Other studies of flooding and various water related problems have been prepared by State agencies and private interest groups. For the sake of brevity, only the most current and still pertinent documents are listed below:

- a. Comprehensive Basin Study Meramec River, January 1964, Main Report with appendices A T; prepared by the St. Louis District, Corps of Engineers.
- b. Summary Report, June 1965; prepared by the St. Louis District, Corps of Engineers.
- c. House Document No. 525, eighty-ninth Congress, Second Session.
- d. "Out of Harm's Way," Lower Meramec Valley Flood Damage Reduction Study, November 1981, prepared by the Missouri Department of Natural Resources and the Upper Mississippi River Basin Commission.
- e. "Lower Meramec River Management Study," August 1980; prepared by the St. Louis County Department of Parks and Recreation.
- f. "Lower Meramec Greenway Study Water Quality Considerations," 1980, prepared by the East-West Gateway Coordinating Council.

STUDY PARTICIPANTS/COORDINATION

The Federal agencies with which the study was coordinated include the U.S. Environmental Protection Agency, Region VII, U.S. Department of Interior-Fish and Wildlife Service, the U.S. Bureau of Mines and the National Park Service. Coordinating State agencies included the Missouri Department of Natural Resources (the lead agency) and the Missouri Department of Conservation. In the private sector, coordination was also accomplished with the St. Louis County Water Company and with the Clayton Engineering Company, consultant to Jefferson County, Missouri. Portions of this study accomplished by other agencies and consultants are listed in TABLE 1.

TABLE 1 CONTRACTOR/AGENCY ASSISTANCE*

Study Contribution

Meramec River Basin Water Supply Study

Public Involvement Program

Heavy Metals Investigations

Remedial Measures for Heavy Metals Problems

Supply-Demand Analysis for Outdoor Recreation

Identification of Historical/ Archaeological Features

Surveys of Endangered Species in the Project Area

Mussels

Bats

Big River Instream Flow Needs

Analysis of Coincident Flooding in the Lower Meramec River

Community Profiles of Population Centers in the Project Area

Name of Contractor/Agency

Institute of River Studies University of Missouri-Rolla

Planning and Management Consultants, Ltd. Carbondale, Illinois

U.S. Fish and Wildlife Service Columbia National Fisheries Research Laboratory Columbia, Missouri

Shannon and Wilson, Inc. St. Louis, Missouri

U.S. Department of Interior National Park Service Omaha, Nebraska

Illinois State University Normal, Illinois

University of Missouri Columbia, Missouri

Missouri Department of Conservation Jefferson City, Missouri

Kenwill, Inc. Jackson, Tennessee

U.S. Fish and Wildlife Service Kansas City, Missouri

Institute of River Studies University of Missouri-Rolla

Department of Rural Sociology, University of Missouri Columbia, Missouri

*Includes only those studies supported entirely or partly by project funds.

PUBLIC INVOLVEMENT

In the Corps' planning process, public involvement has played an increasingly important role in recent years. The goals of the Pine Ford public involvement program were formally defined in terms of: identifying the interested individuals and groups, establishing a two-way communications process and providing a structured means for obtaining public input during different stages of the study. The study team has attempted to do this through a number of public workshops, a series of public fact

sheets on the study's progress, a study notebook and a self-guided tour pamphlet of the study area. These public involvement efforts have provided considerable input from interested citizens regarding their perceptions of the problems and their preferences for various types of solutions. See later sections PROBLEMS AND NEEDS and PUBLIC REACTION.

DESCRIPTION OF STUDY AREA

Meramec Basin.

The Meramec Basin lies in the northern flanks of the Ozarks and encompasses some 3980 square miles comprising all or portions of 15 counties. The Meramec River and its two principal tributaries, the Big River and the Bourbeuse River, converge upstream of the St. Louis metropolitan area.. (See PLATE 1). The basin is primarily rural with nearly two-thirds of its watershed forest covered, but the northeastern portion in and around the metropolitan area is becoming increasingly urbanized. Agriculture and mining have historically played an important role in the area's development and continue to do so today. However, for the past several decades both of these industries have declined in importance as a source of employment. Much of this loss of employment has been offset by development of manufacturing industries, particularly in those counties surrounding the St. Louis metropolitan area. Most of the manufacturing outside of the greater St. Louis metropolitan area is confined to light industry.

Lower Meramec River and Big River.

The Big River Basin and the lower Meramec Basin (that portion of the Meramec downstream from the Big River) comprised the area of major concern in this investigation.

The Big River Basin with its timbered hillsides, steep dolomite bluffs, and generally clear, gravel-bottomed streams is quite appealing from an aesthetic standpoint. The river itself is 137 miles long, drains approximately 970 square miles and is one of the few substantially free flowing rivers in the state. The flow has been altered only by the presence of five mill dams within the river's lower 30 miles. The basin is primarily rural with 67 percent of its area forested, 29 percent devoted to crop production and pastures, 2 percent to mining, and the remaining 2 percent devoted to urban areas and other types of development.

Biologically, the Big River Basin comprises a valuable resource. Its undeveloped portions provide an interspersion of habitat types conducive to a wide variety of terrestrial species including important game species such as white-tailed deer and wild turkey. In terms of the fish species present, the Big River may be characterized as a high quality Ozark stream. However, the sediments in the Big River throughout much of the study area contain heavy metals originating from abandoned lead mining operations and from active and inactive barite excavations and processing sites. Elevated levels of these contaminants have been detected throughout the spectrum of aquatic life.

For at least the past 50 years, the basin's economy has depended heavily on agriculture and mining. Crop production has generally been restricted to the alluvial soils in the valleys and flood plain with the thin residual soils on the uplands being suitable for grazing and timber production. Significant mineral deposits consist of lead, barite, limestone, sand and gravel.

U.S. Census data indicates a somewhat declining role for both agriculture and mining. Data for the three principal basin counties (Jefferson, Washington and St. Francois) indicates that between 1930 and 1974 the number of farms declined by 64 percent and the number of acres devoted to farming declined by 44 percent. Census data also indicates that from 1940 to 1970 the number of people employed in agricultural services declined by 80 percent within the three counties. It appears however, that agriculture's downward trends may level off in the near future. The trend in mining employment tends to be mixed and exhibits a somewhat cyclical behavior. For the three counties as a whole, however, mining employment dropped 41 percent during the interval from 1930 to 1970. The drop in Washington and St. Francois Counties was more dramatic (51 percent) largely due to the exhaustion of the Old Lead Belt in St. Francois County, once the world's major producing area. The drop would have been even more precipitous were it not for the increase in barite mining in Washington County within the past few decades. By contrast, mining employment within Jefferson County has increased by 443 people (354 percent).

The remainder of the study area is comprised of the Meramec River Basin downstream of the Big River's mouth, an area of roughly 330 square miles. The watershed, which is about evenly split between St. Louis and Jefferson Counties, is largely urban and will become increasingly so in the future. The lower Meramec River flood plain is roughly 22 percent forested, 21 percent developed, 55 percent open land (over half of which is cropland), and 2 percent water-covered (a considerable portion of which consists of sand and gravel pits). Several municipalities have significant portions of their commercial and residential properties within the flood plain. State and local governments also have sizable holdings within the flood plain, usually in the form of parks or wildlife conservation areas. According to St. Louis County's General Plan (1981) additional tracts of flood plain are projected for acquisition for recreation by the year 2000.

PROBLEMS AND NEEDS

The water-related problems and needs were identified primarily from three sources: historical records maintained by the Corps and other agencies, technical studies conducted by the Corps and other agencies, and input received from the general public at the October 1981 public workshops. The following paragraphs summarize the major problems identified in the course of this investigation.

Heavy Metals Contamination.

The degradation of the Big River caused by mining wastes was frequently mentioned by attendees of the October workshop and was the problem ranked as most serious. The problem affects more than the river's water quality. Although water quality is a problem, it is not a major concern from the standpoint of human consumption since standard treatment techniques will easily remove the quantities of lead, manganese and iron which are in excess of Missouri Drinking Water Standards. A more serious aspect of the problem is the fact that toxic metals have become concentrated in the streambed sediment and are being taken up by plant and animal life in and along the Big River. Studies conducted by the U.S. Fish and Wildlife Service indicate that every biological aspect sampled at sites downstream of mined areas showed elevated concentrations of metals when compared to samples from a control site near Irondale which was upstream of mined areas. Results are shown in TABLE 2. These same studies indicated that the metals are being transported downstream. These studies did not trace the metals back to their source, hence the degree to which mining wastes contribute to the problem as opposed to the degree to which natural sources contribute was not determined. Investigations conducted by the Missouri Department of Conservation in 1980 resulted in a warning being issued to Big River fishermen to not eat the black redhorse, a member of the sucker family, because lead concentrations in edible portions of the fish exceeded recommended levels for human consumption.

Flooding.

Major floods have occurred on the lower Meramec River on the average of once every six years. During the 20th Century, major floods were experienced in 1904, 1915 (maximum flood on record), 1916, 1927, 1933, 1935, 1939, 1942, 1945, 1947, 1950, 1957, 1961, 1969, 1973 and 1979. Floods on the lower Meramec can be caused independently by heavy, long duration rainfall over the drainage basin or by backwater from Mississippi River flooding or by both mechanisms concurrently. Big River floods can

occur in the same fashion although the backwater it experiences from the Meramec is normally of much shorter duration. Flood damages on the lower 43 miles of the Big River and the lower 38 miles of the Meramec River average \$10,840,000 annually and are distributed as follows:

Big River Structural Damage: \$ 485,000
Big River Agricultural Damage: \$ 1,351,000
Lower Meramec Structural Damage: \$ 8,672,000
Lower Meramec Agricultural Damage: \$ 332,000

Total: \$ 10,840,000

Water Supply.

The adequacy of future water supplies is an issue of considerable concern to the area's residents. At the October 1981 workshops, the public mentioned water supply more frequently than any other problem and also ranked it as one of the most important. Assessing the magnitude of future water supply needs presented considerable difficulty in that it required assumptions concerning future population growth and future consumption rates. Although the Corps contracted for an independent water supply study of the entire Meramec Basin, there remains considerable disagreement between the State of Missouri and the Corps as to the appropriate basic assumptions and, hence, the validity of the study's findings. The disagreements surrounding this study have most likely contributed to the authorization of a new Meramec Basin water supply study (Section 2 of Public Law 97-128). However, to fully assess the feasibility of the Pine Ford Lake, it was necessary to use the results of the disputed study to determine the amount of storage needed for future water supply.

The findings of this study indicate that the great majority of the Meramec Basin and surrounding area will continue to find its current water supply sources (primarily groundwater) adequate for the forseeable future. However, as population and water usage increases, the area in southern St. Louis County and northern Jefferson County which currently draws from the Meramec River may find the river to be an inadequate source during times of drought early in the next century. Even at current rates of withdrawal, it appears that a severe drought could cause adverse impacts to aquatic life on the lowest reaches of the Meramec River.

Recreation.

Next to water supply, attendees at the problem identification workshops mentioned recreation more frequently than any other water resource need but ranked it somewhat lower than the preceding problems. Within the study area, the Missouri Statewide Comprehensive Outdoor Recreation Plan (SCORP) for 1980-1985 indicated priority needs

(determined through a public participation program) for river access areas, lake recreation, trails, hunting lands and preservation of unique natural areas. Furthermore, a 1979 study conducted for the Corps by the National Park Service concluded that a strong unmet demand existed for the types of recreation activities associated with lakes. This conclusion was based on national average standards and weekend peaking of use. However, the State of Missouri disagreed with this finding since the use of Missouri SCORP standards did not support the conclusion that additional water surface acres were needed.

Environmental Quality.

Concerns relating to environmental quality and fish and wildlife conservation were also mentioned frequently at the problem identification workshops. In addition to contaminating aquatic life as earlier discussed, mine tailings cover the river's streambed, thus reducing the fairly diverse aquatic habitat of the natural gravel bottom to a much less productive streambed of shifting sand. Terrestrial habitat, particularly within the lower Meramec Basin, is being displaced by urban development. Two bat species (the gray and the Indiana) classified as endangered by Federal criteria use the Big River. It is likely that the bald eagle, also endangered, visits the area in winter. One endangered mussel (Lampsilis orbiculata) has been noted in the lower Meramec River. Finally, archaelogical and cultural resources are deteriorating through neglect and vandalism.

Other Problems and Opportunities.

Other problems which workshop participants mentioned less frequently included soil erosion, preserving the quality of life within the area, poor land use, and the need for hydropower.

MANAGEMENT MEASURES CONSIDERED

Initially a wide variety of technical and institutional means were identified which could address the problems identified. The implementation of many of these measures depends on entities other than the Corps of Engineers. These measures are listed below, categorized as to whether they are primarily structural or nonstructural measures.

Non-structural.

- Floodproofing floodprone buildings.
- Relocating flood plain residents to sites out of the flood plain.
- Providing a flood warning system with temporary evacuation.
- Enacting flood plain regulations (zoning/building codes).
- Developing greenbelt corridors along streams.
- Providing public access areas to the rivers.
- Implementing water conservation practices.
- Providing interconnections between water utilities.
- Planting vegetation on lead tailings ponds to reduce erosion.
- Covering erodible tailings with fabric.
- Removing and reprocessing lead and barite tailings.

Structural.

- Constructing levees or floodwalls.
- Enlarging and straightening the rivers.
- Constructing dry reservoirs to retain flood waters.
- Constructing multipurpose (wet) reservoirs.
- Constructing water supply reservoirs.
- Constructing water supply pipelines.
- Drilling wells for water supply in the Meramec River Alluvium.
- Improving tiff (barite) pond dams to reduce the chance of failure.
- Providing detention basins downstream of mine tailings.
- Diverting runoff and streamflow around tailings.
- Constructing detention basins within the river to trap mine tailings.

TABLE 2

Metal Concentration Factors Using Irondale As A Control Site *

Aspect Sampled	Irondale (River Mile 118)	Desloge	Washington State Park	Brown's Ford (River Mile 49)
Streambed Sediment		_		
Lead	1X	45X	37X	29X
Cadmium	1X	18X	7X	4X
Zinc	1X	26X	11X	7X
Copper	1X	, 5X	4X	4X
Barium	1 X	<1X	3X	3X
Crayfish Lead	1 X	100X	93X	78X
Cadmium	1X	4X	3X	3X
Zinc	1X	2X	2X	1 X
Copper	1X	1X	1 X	1X
Barium	1X	<1X	1X	1 X
			• • • • • • • • • • • • • • • • • • • •	• **
Pocket Mussels (Soft Tissue)	1 X	**	113X	179X
Lead	1X	**	41X	70X
Cadmium	1X	**	8X	27X
Zinc	1X	**	8X	9X
Copper Barium	1X	**	<1X	<1X
	1/		31 X	\ (\)
Redhorse (Suckers)				
Lead	1 X	28X	22X	34X
Cadmium	1X	3X	1 X	1X
Zinc	1 X	2X	1X	1X
Copper	1 X	<1X	<1 X	<1X
Barium	1 X	<1X	1 X	2X
Attached Algae				
Lead	1 X	74X	38X	40X
Cadmium	1 X	3X	4X	4X
Zinc	1 X	16X	7X	8X
Copper	1 X	2X	1 X	1 X
Barium	1 X	<1X	<1 X	1 X
Water Willow (Roots)				
Lead	1 X	127X	42X	63X
Cadmium	1 X	70X	20X	9X
Zinc	1 X	23X	15X	11X
Copper	1 X	2X	4X	3X
Barium	1 X	1 X	6X	4X

Concentrations used to develop this table were taken from studies conducted by Schmitt and Finger, U.S. Fish and Wildlife Service, February 1982.

^{**} No Mussels were found at Desloge.

<1X means less than Irondale Concentration, 3X means 3 times greater than Irondale Concentration.

SCREENING OF MEASURES

A preliminary examination of the preceding measures resulted in a number of them being dismissed from further consideration. First of all, an inventory of access areas being provided by the State of Missouri within the Meramec Basin indicated that the need for such facilities is being met. For this reason, consideration of additional river access areas, including the 19 angler use sites currently authorized, was dismissed. Enlarging and straightening the Big River and lower Meramec River was also dismissed because of the environmental and aesthetic degradation it would cause. Reprocessing mine tailings was dismissed after discussions with the U.S. Bureau of Mines which concluded that the measure was economically infeasible and presented problems with respect to a safe disposal site for the reprocessed tailings. Wells in the Meramec River alluvium were also dismissed as being inadequate to supply the quantities of water needed for the southern St. Louis Metropolitan Area. Finally, a water supply pipeline from the Mississippi River was dismissed after discussions with the major utility in the area because of the severe treatment problems posed by the variable water quality in the Mississippi River below the city of St. Louis.

RESULTS OF LAKE STUDIES

As discussed earlier (see SCOPE OF STUDY), the reservoir analysis was limited to two lakes, Pine Ford and Irondale. Since Pine Ford Lake was being funded by Congress for advanced engineering and design, it was investigated in considerably more detail than was Irondale Lake. It should also be pointed out that, for an authorized project, it is normally Corps policy to include consideration of recreation as a purpose only if it has a current letter of intent from a prospective non-Federal sponsor. Although the State of Missouri in 1966 furnished a letter of intent to sponsor recreation at Pine Ford. Irondale, and I-38 Lakes, it withdrew that intent in 1979 citing fiscal and constitutional problems with such commitments. At the request of the St. Louis District Corps of Engineers, the State is currently reviewing that decision. For this reason and because, for an initial screening of economic feasibility, the St. Louis District wished to test these two reservoir sites as if developed to their fullest extent (thus yielding the best possible economic results), recreation development was included in the reservoir analyses.

The Pine Ford Lake was formulated to include provisions for flood control, water supply, low flow augmentation for downstream aquatic life, recreation, and hydropower. Incidental benefit to navigation on the Mississippi River also resulted

from reservoir releases for other purposes. Thirteen separate dam sites were examined between Morse Mill and Brown's Ford Bridge (a 16 mile reach) before the best Pine Ford site was selected. At the selected site a number of different size reservoirs were tested. Flood protection storages ranging from a 5-year flood to storage of a 200-year flood were examined. Several sizes of normal pool were also tested. Pine Ford Lake was examined and benefits were assigned as though that lake would be the only lake (of the original five authorized) to be constructed within the basin. In addition, Pine Ford Lake was formulated assuming that both Pine Ford Lake and Ifondale Lake would be constructed. In all cases tested, Pine Ford Lake failed the basic economic test of returning at least as much in average annual benefits as it cost when amortized over a 100-year project life at 3-1/4 percent interest. At its optimum size, the lake was estimated to cost approximately \$170 million and to return approximately \$0.90 for every dollar invested. All cases developed for a dry detention (flood control only) reservoir were economically infeasible by an even greater margin. In addition, the fact that the lake's drainage area contains large deposits of lead and barite mine tailings also creates a major uncertainty with respect to the viability of a lake at this site. The mine wastes, a current problem for the Big River even without a reservoir (see WATER RELATED PROBLEMS), could undergo chemical reactions within a deep lake which would release even more potentially toxic metals to the environment. Finally, the U.S. Fish and Wildlife's assessment of the lake's adverse impacts on fish and wildlife habitat has caused that agency to oppose construction of the lake.

Irondale was formulated using much the same assumptions that were used for the Pine Ford formulation. The level of detail in developing costs, however, was considerably less than that employed for Pine Ford. Also, alternative dam sites were not examined for Irondale (only the authorized site), and the feasibility of including hydropower was not examined. The results, which for Irondale should be regarded as preliminary, indicate that a reservoir at Irondale is also economically infeasible.

LOCAL FLOOD DAMAGE PREVENTION MEASURES

Local measures are so classified because, unlike lakes, they primarily affect only the immediate area in which they are implemented. With regard to these measures, the Pine Ford study confined its investigation to the area where the majority of flood damages were concentrated, namely the lower Meramec River. (Previous sections indicated that roughly 85 percent of the area's total damages and nearly 95

percent of structural damages occur in this reach.) It is also important to note that the examination of these measures has been preliminary. The recent authorization of a future study of flood damage prevention measures on the lower Meramec River (Public Law 97-128) should permit a more detailed investigation of these measures. Nevertheless, a discussion of preliminary findings is presented in the following paragraphs.

Levees. Levees were examined for nine communities along the lower Meramec River. In each case only one size of levee was examined - a height sufficient to protect against the highest flood which could reasonably be expected (termed a "standard project flood"). The results, assuming a 100-year project life and a current interest rate of 7-5/8 percent, indicated that few, if any, levees appeared to be economically justified for this particular level of protection. There is the possibility that a more detailed study examining a lesser degree of protection and somewhat different levee alinements could produce an economically feasible plan. It is recommended that such studies be pursued by the Corps under the authority granted in Section 2 of Public Law 97-128.

Non-structural Measures. A number of nonstructural flood damage prevention measures for the lower Meramec River were also examined in a preliminary fashion. Floodproofing homes and businesses and relocating homes and businesses to sites outside the flood plain both yielded results which were encouraging enough to warrant more detailed study. A greenbelt corridor plan which connected several existing riverside parks and other publicly owned lands along the lower 34 miles of the Meramec River was also investigated. Preliminary results indicate that this measure should also be investigated in greater detail. Two other measures, flood plain regulations and a flood warning system coupled with emergency evacuation procedures are also deserving of further investigation. At the February public workshops, the attendees expressed a greater preference for flood plain regulations than for any other structural or nonstructural measure presented. However, only 12 percent of the attendees were residents of communities which would be candidates for such regulations.

Successful implementation of almost any nonstructural plan requires acceptance by those people directly affected. To gain acceptance, or to determine the lack of it, requires an intensive public involvement program in the specific locale where nonstructural plans are being proposed. It requires a gradual progression from general concepts to ever more detailed plans with considerable sharing of these results with the affected public along the way. The large geographic scope and wide range of plans covered by this study have not permitted this type of intensive effort on nonstructural plans. It is recommended that such studies be pursued by the Corps under the authority granted in Section 2 of Public Law 97-128.

MINE TAILING REMEDIAL MEASURES

As pointed out earlier, it has not been conclusively proven that mine tailings are the only significant source of toxic metal contaminants in the Big River. However, it is generally accepted that the tailings are a major source of such contaminants. The public, as demonstrated at the October 1981 Problem Identification Workshops, regarded the problem of toxic metal contamination as the area's most pressing problem.

The Corps of Engineers has examined a number of measures (see MANAGEMENT MEASURES CONSIDERED) which could address this major source of contaminants. Additional study will be necessary to better define the problem and refine the design of remedial measures. Also, because of the precedent setting nature of Federal involvement in such actions, implementation responsibilities and cost sharing remain to be resolved. In selecting remedial measures, the preferred solution was containment of the tailings at the site rather than attempting to reclaim the tailings once they had entered the surface waters. The most promising measures consist of various combinations (depending on the site being addressed) of the following:

- Regrading embankment slopes.
- Covering embankment with fabric and/or riprap.
- Vegetating the surfaces of tailings ponds.
- Enlarging and/or riprapping emergency spillways.
- Constructing sedimentation ponds downstream of tailings sites.

OTHER WATER SUPPLY ALTERNATIVES

Multipurpose reservoirs, the one water supply alternative in which the Federal Government can cost share, has already been discussed. Other means of supplying water to serve the future needs of the southern St. Louis metropolitan area were investigated for two reasons. First, it is obvious that in a water rich area such as the St. Louis metropolitan area, there are numerous solutions to the problem. The task is one of selecting the cheapest, most reliable, and least environmentally damaging solution. Secondly, the benefits attributable to water supply storage in a reservoir are most commonly assumed to be the cost of the most likely alternative source.

Hence, to determine multipurpose reservoir benefits it is necessary to investigate other options.

Three structural options were investigated: a single purpose water supply reservoir at the Irondale site on the Big River, a pipeline to transfer treated water from the Missouri River directly to the area of need, and a pipeline to divert Missouri River water to the Bourbeuse River where it would then flow into the Meramec River and be carried downstream to the area of need. St. Louis County Water Company has indicated that piping treated water from the Missouri River would be the option most likely to be pursued by them at such future time as the Meramec River proved to be an unreliable source. Based on preliminary studies, the cheapest of the three alternatives, however, appears to be the diversion of Missouri River water to supplement natural flows on the Bourbeuse and Meramec Rivers during times of drought. Although settling basins were included in the plan to reduce the higher silt load of Missouri River water, additional means of addressing chemical differences between the two river systems may be required to prevent environmental damage on the Bourbeuse and Meramec Rivers. It may also be necessary to address certain legal ramifications involved in an interbasin transfer of water. The third structural option, development of a single purpose water supply reservoir at Irondale, appears to be more expensive than either of the pipeline alternatives. Additional development of the Irondale site to include recreation or other purposes could render a much more economically attractive option.

An investigation of certain water conservation measures indicated that implementation of some measures are probably cost effective and would also delay into the future the time when alternative water supply sources are needed.

The results of this water supply investigation indicates that additional study is needed, first of all, to better define the extent of future needs and secondly to investigate a wider range of alternatives in greater detail than has been addressed in this study. Section 2 of Public Law 97-128 which authorized the Corps to conduct a Meramec Basin water supply study in full cooperation with the State of Missouri should satisfy this need.

PUBLIC REACTION

Public workshops were held in February 1982 to present some 20 different measures, including "No Corps Action", which addressed the problems within the study area. Attendees were also asked to rate each measure on a numerical scale to indicate whether the measure was preferred or not preferred.

When the results were tallied, few measures stood out dramatically. One measure, "Flood Plain Regulations" was rated significantly higher than the others and elicited less disagreement than most. "River Access Areas" was also rated relatively high and met with considerable agreement among attendees. The least preferred measures included "Sediment Traps", "Rerouting Big River" (to address heavy metals contamination), "Missouri River/Bourbeuse River Pipeline", "Single Purpose Irondale Reservoir" (water supply), "Floodproofing", and "Single Purpose (flood control) Reservoirs".

No The greatest disagreement occurred on the subject of "Multipurpose Reservoirs" and "No Corps Action". Ratings on these proposals tended to be strongly "for" or strongly "against" with very few in the more neutral ranges of the scale. Considering the heavy snow cover and frigid temperatures at the time of the workshops, it is perhaps understandable that those who attended were highly motivated. Since the polarized views tended to average out overall, these two proposals tended to rank toward the middle of all measures with "No Corps Action" being somewhat more preferred than "Multipurpose Reservoirs".

Considerable disagreement was also evident for the nonstructural measures "Water Conservation", "Greenbelts", and "Permanent Flood Plain Evacuation", although not as great as for the preceding two measures.

CONCLUSIONS

After a reexamination of the problems and needs within the study area and a reevaluation of measures which could address those problems and needs, the study team has concluded the following:

a. A Pine Ford Reservoir for the purposes of flood control, water supply, recreation, fish and wildlife conservation and other incidental benefits is infeasible due to lack of economic justification (at both the current interest rate of 7-5/8 percent and the authorized rate of 3-1/4 percent) and also due to the potential of a reservoir at that location to increase the concentrations of heavy metals in various biological elements. This finding holds true regardless of the combination of purposes or the physical scale of the facility. The uncertainties associated with further heavy metals contamination within a reservoir would remain a concern even with the considerable positive effects of accomplishing remedial measures for existing and future mining wastes. Moreover, results of the public involvement program indicate that a Pine Ford Lake would experience a mixed reception from the public. Other, less comprehensive measures or no action at all appear to enjoy somewhat wider acceptance. In addition, the State of Missouri has withdrawn its letter of intent to sponsor recreation at the project. Efforts to secure a recreation sponsor with the State and the appropriate counties have been unsuccessful to date. Finally, the U.S. Fish and Wildlife Service, in its Coordination Act Report, indicates that it opposes construction of Pine Ford Lake due to the associated loss of fish and wildlife habitat.

- b. Any decision concerning the Irondale Reservoir should be postponed until the results of the recently initiated Meramec Basin Water Supply Study (authorized by Section 2 of Public Law 97-128) are available to better define this need. Although the Irondale Reservoir, at its authorized size, appears economically infeasible at this time, based on preliminary studies, a definite finding regarding this reservoir can be made only upon completion of detailed engineering and economic studies. If the Meramec Basin Water Supply Study indicates that the Irondale Lake is the best solution to the area's problems, a separate reevaluation study would be conducted using project-specific funding.
- c. The need for the nineteen angler use sites, authorized as part of the comprehensive basin plan, no longer exists. This need has been met or is in the process of being met by facilities provided by the State of Missouri.
- d. No extensive reexamination of the I-38 Reservoir was necessary for the following reasons. The State of Missouri, by letter dated 17 December 1981, withdrew as local sponsor for recreational development. Low flow augmentation for water quality, in accordance with current EPA policy, has been eliminated as an allowable project purpose. Incorporating these changes and updating previous estimates of costs and benefits to account for the effects of inflation indicate that the project is no longer feasible at either the current interest rate or the authorized rate. Therefore, expenditure of study funds to examine this measure in greater detail was viewed as both unnecessary and imprudent.
- e. Any extensive reexamination of Union Lake would be an unwise use of study funds. As the basis for this conclusion, the project is not currently supported by any member of the Congressional delegation, and both the incumbent Congressman and his predecessor have introduced bills to deauthorize the project. Underlying this Congressional action is the fact that the project is not generally supported by the local population (as evidenced by surveys conducted by Congressional interests). In addition, the U.S. Fish and Wildlife Service, with the concurrence of the Missouri Department of Conservation, has recommended that the project not be constructed because of severe adverse impacts on high quality wildlife resources.

f. The area has several significant problems which should receive additional study either under existing or proposed authorities. Flooding along the lower Meramec River is a major problem which should be further addressed under authority granted by Section 2 of Public Law 97-128. Structural and nonstructural measures which appear worthy of further study include levees, floodproofing, permanent relocation in conjunction with a greenbelt corridor, a flood warning system and flood plain regulations. Since considerable disagreement exists concerning the results of the current water supply study, further study into the area's future water supply needs and alternative solutions is advised. Section 2 of Public Law 97-128 grants this authority. Finally, under existing conditions, heavy metals contamination within the Big River system poses serious harm to plant and animal life within and along the stream and hence indirectly to man. Studies to date indicate that this problem could substantially be reduced by the implementation of remedial measures at or near the sites of mining wastes. However, additional studies are needed to better define the problem and further develop remedial measures. At present, there is no existing authority for further study of this problem.

TENTATIVE RECOMMENDATIONS

In view of the foregoing, it is recommended that:

- a. The Pine Ford Reservoir and the nineteen angler use sites, as authorized by Section 203 of Public Law 89-789, be deauthorized.
- b. The I-38 Reservoir, as authorized by the above cited legislation, be placed in an inactive status to become eligible for the project deauthorization review program.
- c. The Union Reservoir, authorized by Section 4 of Public Law 75-761 be placed in an inactive status to become eligible for the project deauthorization review program.
- d. The Irondale Reservoir, as authorized by Section 203 of Public Law 89-789, retain its active status until completion of the Meramec Basin Water Supply Study better defines the needs that the project might serve.
- e. The Meramec Basin Water Supply Study and the Lower Meramec River Flood Control Study, both authorized by Section 2 of Public Law 97-128, be undertaken to better define those problems and their potential solutions.
- f. The Corps of Engineers be authorized to conduct additional studies of the problem of stream contamination from mine tailings in streams of the Meramec Basin to determine the economic and environmental feasibility of various remedial measures.

